Docket No.: 2360-0528PUS1
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK O(F)(F)ICE

In re Patent Application of: Frank FILSER et al.	
Application No.: 09/623,268	Confirmation No.: 1826
Filed: August 30, 2000	Art Unit: 1791
For: DENTAL CROWNS AND/OR DENTAL BRIDGES	Examiner: J. L. Lazorcik

APPEAL BRIEF

MS Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

This brief is filed more than two months after the Notice of Appeal filed in this case on October 19, 2009, and is in furtherance of said Notice of Appeal.

The fees required under 37 C.F.R. § 41.20(b)(2), and any required petition for extension of time for filing this brief and fees therefore, are dealt with in the accompanying TRANSMITTAL OF APPEAL BRIEF.

This brief contains, under the appropriate headings and in the order indicated, the following items as required by 37 C.F.R. § 41.37(c) and M.P.E.P. §§ 1205 and 1205.02:

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I. REAL PARTY IN INTEREST

The real party in interest for this appeal is:

EIDGENOSSISCHE TECHNISCHE HOCHSCHULE ZURICH

II. RELATED APPEALS AND INTERFERENCES

There are no other appeals, interferences, judicial proceedings or continuing applications or requests for continued examination which will directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

III. STATUS OF CLAIMS

A. Total Number of Claims in Application

There are 22 claims pending in the application.

B. Current Status of Claims

1. Claims canceled: 1-15 and 35-40.
2. Claims withdrawn from consideration but not canceled: none.
3. Claims pending: 16-34 and 41-46.
4. Claims allowed: none.
5. Claims rejected: 16-34 and 41-46.

C. Claims On Appeal

The claims on appeal are claims 16-34 and 41-46 (as shown in the attached "**VIII. Claims Appendix**").

IV. STATUS OF AMENDMENTS

No amendment was filed after the final rejection (of May 18, 2009).

Thus, all previous amendments/replies by Appellant have been entered into the record.

V. SUMMARY OF CLAIMED SUBJECT MATTER

All references made in the instant Appeal Brief will be made with reference to the Substitute specification (containing paragraphs [0001]-[0059]) filed at the U.S. Patent and Trademark Office on May 3, 2004.

Independent claim 16

As recited in independent claim 16, the present invention is directed to a process for production of an artificial tooth substitute which can be fitted on a prepared dental stump, where taking into account the shrinkage, on the basis of a model, a fully ceramic skeletal structure of biologically compatible material is calculated, produced from a blank by material removal, dense-sintered and a coating applied (see paragraph [0001]). The claimed process of claim 16 has 10 steps. Specifically, as recited claim 16, the present invention involves (for all steps, see paragraphs [0006], [0018]-[0028], [0036]-[0043]):

(1) processing ceramic powder to form a homogeneous blank of porous ceramic material (see the end of paragraph [0005], paragraph [0028]);

(2) determining a relative density ρ_R and an achievable relative density ρ_S after sintering for the blank of porous ceramic material selected in step (1) (paragraph [0020]);

(3) calculating an enlargement factor "**(f)**" (equation for this factor shown below and on the next page; paragraph [0020]);

(4) scanning and digitizing a three-dimensional outer and inner surface of a positive model of the skeletal structure (e.g., for tooth crowns and/or tooth bridges) (paragraphs [0006], [0039]),

(5) enlarging linearly in all directions by an enlargement factor "**(f)**" compensating precisely for the sinter shrinkage (paragraph [0021]),

(6) transferring the modified data to the control unit of a processing machine (paragraph [0039];

(7) processing the blank of porous ceramic from step (1) in the processing machine and removing material to produce a design form of the enlarged model (paragraphs [0006], [0022], [0039]);

(8) sintering the design form of porous ceramic material to obtain a skeletal structure having precise end dimensions (paragraph [0040]);

(9) facing the skeletal structure to form the artificial tooth substitute (paragraphs [0006], [0026], [0043], [0044]); and

(10) repeating steps (1)-(9) (paragraphs [0026], [0029], [0033]).

The enlargement factor "**(f)**" is as follows (paragraph [0020][1]):

$$f = \sqrt[3]{\frac{\rho_S}{\rho_R}}$$

Generally, with the presently claimed process, the dimensions of the surface of the skeletal structure model are enlarged linearly in all directions by enlargement factor **(f)** to compensate for shrinkage on sintering. The above enlargement factor **(f)** is derived from the relative density $\boldsymbol{\rho_R}$ of the preproduced blank and the achievable relative density $\boldsymbol{\rho_S}$ after sintering according to the above equation (see paragraph [0020]).

Further embodiments are recited in dependent claims 16-31 and 34. For instance, claim 18 is directed to achieving a density within 90-100% of the achievable relative density upon sintering the enlarged model (paragraph [0025]).

Independent claim 32

Claim 32 is an independent claim directed to a process for production of an artificial tooth substitute to be fitted on a prepared dental stump. Claim 32 differs from claim 16 in several respects. For instance, the first step involves (1) scanning and digitizing a three-dimensional outer and inner surface of a positive model of a skeletal structure for the artificial tooth substitute to obtain data (see paragraph [0006]) (claim 1 involves processing ceramic powder). The other steps in claim 32 involve: (2) determining an enlargement factor **(f)** for the obtained data, where ρ_R is the relative density and ρ_S is the achievable relative density after

[1] The USPTO PAIR website shows an incorrect formula; however, see also page 5 of the originally filed specification for the correct formula.

sintering (paragraph [0020]); (3) enlarging the obtained data linearly in all directions by the enlargement factor (f) thereby compensating precisely for sinter shrinkage to obtain modified data for an enlarged model (paragraph [0021]); (4) transferring the modified data to a control unit of a processing machine for generating a desired path of a tool (paragraph [0039]); (5) ceasing scanning and digitizing (paragraphs [0006], [0022]); (6) processing a blank of porous ceramic material in the processing machine wherein material is removed by the tool moving along the devised path to produce a design form of the enlarged model (paragraphs [0006], [0022], [0039]); (7) dense-sintering the design form of porous ceramic material to obtain a skeletal structure having precise end dimensions (paragraph [0040]); (8) facing the skeletal structure as desired to form the artificial tooth substitute (paragraphs [0006], [0026], [0043], [0044]); and (9) repeating steps (1) through (8) for each artificial tooth substitute to be produced (paragraphs [0026], [0029], [0033]).

Another embodiment is recited in dependent claim 42.

Claim 33

Claim 33 is similar to claim 16 with a few exceptions. Step (1) of claim 33 involves selecting the ceramic material having a relative density of ρ_R (paragraphs [0005], [0028]). The other steps of claim 33 are:

(2) sintering a further piece of the porous ceramic material under a set of sintering conditions to obtain an achievable relative density ρs of the ceramic material after sintering (paragraph [0040]);

(3) determining the enlargement factor **(f)** (see same formula above);

(4) scanning and digitizing a three-dimensional outer and inner surface of a positive model of a skeletal structure for the artificial tooth substitute to obtain data (paragraph [0039]);

(5) enlarging the obtained data linearly in all directions by the enlargement factor **(f)** thereby compensating precisely for sinter shrinkage to obtain modified data for an enlarged model (paragraph [0021]);

(6) transferring the modified data to a control unit of a processing machine (paragraph [0039]);

(7) processing the blank of porous ceramic material in the processing machine and removing material therefrom to produce a design form of the enlarged model (paragraphs [0006], [0022], [0039]);

(8) sintering under the set of sintering conditions of step (2)[2] the design form of porous ceramic material to obtain a skeletal structure having precise end dimensions (paragraph [0040]);

(9) facing the skeletal structure as desired to form the artificial tooth substitute (paragraphs [0006], [0026], [0043], [0044]); and

(10) repeating steps (1) through (9) for each artificial tooth substitute to be produced (paragraphs [0026], [0029], [0033]).

A further embodiment is recited in dependent claim 43.

Claim 44

Independent claim 44 adds to previously submitted independent claim 16 the additional process step of supplementing an incomplete positive model by computer technology (see paragraph [0018]). Appellants note step (4).

Claim 45

Independent claim 45 is based on pending claim 16. Additionally, two process steps have been included. The first additional process step is related to the application of data for the enlargement factor on the blank or an attachment label after calculating said enlargement factor (see paragraph [0033]). Appellants note step (3). The second additional process step deals with the reading of the data applied on the blank before enlarging the digital description of the positive model (see paragraph [0033]). Appellant note step (5).

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[2] Appellants note that "step (b)" is erroneously recited in the current set of claims.

Claim 46

Independent claim 46 is based on pending claim 16. Additionally, the removing of an outer layer of the blank has been included (see paragraph [0054]). Appellants note step (1).

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Claims 16-34 and 41-46 are pending. The grounds of rejection to be reviewed on appeal are:

1) Whether or not claims 16-34, 41-43 and 45 under 35 U.S.C. § 103(a) are patentable over **Wohlwend** (U.S. Patent No. 6,106,747) in view of Appellants' previous Exhibit A of a John **Halloran** letter dated April 6, 2004 (see Final Office Action (hereinafter referred to as "**Final OA**"), paragraphs 1-2 at pages 3-9; hereinafter "**Rejection (1)**").

2) Whether or not claim 44 under 35 U.S.C. § 103(a) is patentable over **Wohlwend** in view of **Halloran** as applied to claim 1 above in further view of **Guiot** et al. (U.S. Patent No. 6,287,121) (Final OA, paragraph 3 at pages 9-11; hereinafter "**Rejection (2)**").

3) Whether or not claim 46 under 35 U.S.C. § 103(a) is patentable over **Wohlwend** in view of **Halloran** as applied to claim 1 above in further view of **Glass** et al. (Conference Proceedings -1995) (Final OA, paragraph 4 at pages 11-13; hereinafter "**Rejection (3)**").

VII. ARGUMENTS

The following arguments were previously asserted at least in the responses dated January 12, 2009 and November 15, 2007. Some of the arguments below can also be found in the Appeal Brief filed on August 16, 2007.

Summary of Invention and Its Advantages

The object of the present invention is to provide a process which allows the production of fully ceramic tooth crowns and/or tooth bridges with a skeletal structure of dense-sintered, high strength ceramic for fitting and adhesive and/or retentive fixing on natural or artificial dental stumps (see substitute specification, paragraph [0005]). The process allows the production of tooth crowns and/or bridges with occlusal and cavital surface of materials which shrink on sintering, which have a perfect fit even with a filigree form, *i.e.*, require no further work (paragraph [0005]). The presently claimed process provides a blank of oxide ceramic material via a simple precise performance of the process (see paragraph [0005])

It is worth noting that the enlargement factor **(f)** is recited in each of independent claims 16, 32, 33, 44, 45 and 46 (and thus of course is recited in the dependent claims). The enlargement factor **(f)** is derived from the relative density $\boldsymbol{\rho_R}$ of the preproduced blank and the achievable relative density $\boldsymbol{\rho_S}$ after sintering according to the above equation (see paragraph [0020]). With the presently claimed processes, the dimensions of the surface of the skeletal structure model are enlarged linearly (by enlargement factor **(f)**) in all directions to compensate for shrinkage upon sintering. And by utilizing the claimed enlargement factor **(f)**, the present invention provides advantages that include requiring no further work since the claimed process makes a tooth crown and/or bridge having a perfect fit even with a filigree form (see paragraph [0005]), and yielding a simple, safe method at a low cost (paragraph [0028]).

Why do Appellants provide the above background, including the advantages of the present invention? Because the primary reference of Wohlwend cited in each of Rejections (1)-(3) discloses a different enlargement factor (e.g., "one-size fits all"), wherein its disclosed factor does not take into account any isotrophy or the position of the blank. There is no recognition or disclosure of the instantly claimed enlargement factor **(f)** (including the cube root of $\boldsymbol{\rho_{S/}\rho_R}$) in

any of the cited references. Instead, the Examiner has improperly derived the claimed enlargement factor **(f)**, wherein one of ordinary skill in the art would not derive the claimed enlargement factor **(f)** as done so by the Examiner in the Final OA.

Now, Rejections (1)-(3) as applied to specific sets of claims are discussed below.

<u>Arguments Against **Rejection (1)** - Claims 16-34 and 41-43</u>

Generally, the Examiner combines Wohlwend and the Halloran letter by: citing the generic enlargement factors in Wohlwend; stating that the claimed enlargement factor **(f)** is an "obvious solution"; and that the ordinary skill in the art is shown in the secondary reference of Halloran (Final OA, pages 3-6). Thus, the Examiner concludes that determining enlargement factors such as that claimed is merely a "routine operation" (Final OA, page 6), as labels the claimed enlargement factor **(f)** as being "intuitive" and "obvious mathematical basis" (Final OA, page 5, third paragraph).

The cited primary reference of Wohlwend teaches the use of purely empirical enlargement factors (see, e.g., col. 3, lines 40-43 of Wohlwend), wherein its enlargement factor is assumed to be constant (see Appellants' response of January 12, 2009, starting at page 13). Put differently, the cited primary reference of Wohlwend teaches a generic, *"one-size fits all"* parameter for blanks. The deficiencies of Wohlwend are also mentioned at page 5, second paragraph of the Final OA. Such disclosure in Wohlwend is in sharp contrast to the claimed invention. With the present invention, the enlargement factor **(f)** takes into account the relative densities of the blank before and after sintering.

More specifically, the presently claimed invention is directed to a specific enlargement factor **(f)** - - (**(f)** = $\sqrt[3]{\rho_S/\rho_R}$) - - that is derived for each individual blank in a scientific and reproducible manner by taking into account the relative densities of the blank before and after sintering. As stated in Appellants' specification, the enlargement factor **(f)** compensates precisely for the shrinkage that occurs during sintering (see, e.g., page 3, lines 8-22) and thus the present invention solves problems in the art.

The actual disclosure of Wohlwend is mentioned in the Final OA. But as admitted in the

Final OA, the cited primary reference of Wohlwend fails to disclose the instantly claimed enlargement factor **(f)** that may be calculated on the basis of a measurable parameter of the blank, as well as failing to disclose the relation between relative densities of the blank and the enlargement factor. Wohlwend also fails to disclose a linear relationship between the enlargement factor and the shrinkage of the blank upon sintering. These are <u>major</u> deficiencies of the primary reference, which are not properly accounted for in the cited secondary reference(s) (as explained below).

Still, in forming the final rejection, as stated in the Final OA at page 5, last paragraph, the Examiner compensates for the deficiencies of Wohlwend by explaining how the claimed enlargement factor details "appear on their face to merely state an obvious solution to the enlargement operation contemplated and disclosed by Wohlwend." Of course, as also accounting for deficiencies of Wohlwend, the Halloran letter is cited as a secondary reference (Final OA, page 6) as disclosing the ordinary level of skill in the art and allegedly known problems in the art.

However, as a matter of fact and law, the Examiner has accounted for the claimed enlargement factor and all method steps in error. In Final OA at page 5, the Examiner states:

> It is instructive here to examine the Applicants enlargement factor to understand its intuitive and obvious mathematical basis. First Applicant teaches a material density prior to sintering, ρr or "the relative density, and a post-sintering density, ρs or "the achievable relative density". Assuming conservation of mass, the fraction ρs/ρr is simply a mathematical representation for fractional volume shrinkage for the ceramic body from the pre-sintering stage to the post-sintering stage. The cube root of the volume ratio

> merely reduces the volumetric contraction (ρs/ρr) into a linear vector quantity which one of ordinary skill would recognize an obvious and natural form for scaling a digital representation (read x,y,z coordinates) of a volumetric body. Restated, although Wohlwend does not explicitly set forth the details of Applicants claimed enlargement factor, said enlargement factor details appear on their face to merely state an obvious solution to the enlargement operation contemplated and disclosed by Wohlwend.

The Examiner's way of "assuming of conservation of mass" does not originate from any of the cited references. Even if this statement regarding assuming conservation of mass is from the Examiner's own rationale, this is merely a creation of fact that has nothing to do with the instantly claimed enlargement factor **(f).** Such conclusions in the Office Action amount of improper hindsight reconstruction. *See Graham v. John Deere Co.*, 383 U.S. 1, 36, 148 USPQ 459, 474 (1966) (discussing the "importance of guarding against hindsight ... and resist[ing] the temptation to read into the prior art the teachings of the invention in issue" when considering the obviousness of a patent).

As previously explained (see, e.g., Appellants' response of January 12, 2009, starting at page 14), the Wohlwend factor only works with at least two preconditions: **(1)** an exact mass conservation during sintering has to be assumed; and **(2)** a blank with homogeneous density distribution has to be provided. Only under these at least two pre-conditions would the enlargement factor be independent of the position in the blank *and* isotropic in all directions.

But such preconditions, or any recognition thereof, are not disclosed in Wohlwend (or even in Halloran). These relationships/factors have only been disclosed *in Appellants' specification*. The same is true with regard to the claimed cube root of $\boldsymbol{\rho_S/\rho_R}$, wherein the Examiner is improperly accounting for the deficiencies of Wohlwend (as well as Halloran). The derivation by the Examiner of the claimed enlargement factor **(f)** in the Final OA is essentially manufactured after a reading of Appellants' specification. One of ordinary skill in the art upon reading Wohlwend would never link the shrinkage to density (also note the discussion of the actual disclosure of this reference below). Further, Wohlwend does not disclose linear

enlargement as instantly claimed. As the Board can see from a review of the prosecution history of this application, his has been a point of contention.

Appellants note the remaining disclosure of Wohlwend, wherein Wohlwend is improperly cited as a part of Rejection (1). Wohlwend solves a problem of deformation and susceptibility to cracks (especially the fine margins) during a final sintering step (col. 1 lines 66 67, and col. 2, lines 1-22). Wohlwend especially concludes that this is the major problem associated with the fabrication of dental restorations and its affiliated processes using presintered members and sequentially sintering this. Because of this, Wohlwend teaches the use of a "working stump or a work pack possing a shrinkage factor which is basically equal to that of the constructive material". The presently claimed process is much simpler than the Wohlwend process and does not require, e.g., the working stump of Wohlwend. And as also mentioned, the present invention has the advantages of requiring no further work since the claimed process makes a tooth crown and/or bridge having a perfect fit even with a filigree form (see paragraph [0005]) and thus simple, safe and at a low cost (paragraph [0028]).

Further, Wohlwend makes mandatory use of the working stump / pack, and sintering the combination of both. Wohlwend's abstract states that the working stump and working pack are produced "such that they are enlarged by a predetermined enlargement factor" (see column 5, lines 15-25). However Wohlwend never links the shrinkage to density. Halloran does not resolve such problems and deficiencies of Wohlwend. The fact that a claimed invention is within the broad field of the prior art – and the fact that one might arrive at it by selecting specific items and conditions within the prior art – does not render the invention obvious in the absence of clear directions or reasons for making such selection. *Ex parte Kuhn*, 132 USPQ 359 (BPAI 1961); *In re Baird*, 29 USPQ2d 1550 (Fed. Cir. 1994).

Regarding the secondary reference of Halloran, this reference is improperly cited in the first place. Furthermore, even if Halloran was somehow considered, there is no guidance or disclosure for one ordinary skill in the art to achieve the present invention, and any reliance on Halloran is based on improper hindsight reconstruction.

Citing the Halloran letter is improper, as it does not constitute "prior art" as explained in Appellants' response of January 12, 2009 (see page 14). First, there is no proof this "reference" was even publicly available, making such a reference available as prior art under one of the section of 35 U.S.C. § 102. Second, it is worth noting that the Halloran letter was created after reviewing the present application. Specifically, the Halloran letter has to be interpreted in view of the following initial position: "At issue is if the 'enlargement factor' as defined in the patent application, is specified well enough for one skilled in the art to make use of the invention." (Emphasis added; Halloran letter, page 1, second paragraph) .

One has therefore to assume that the statements in the Halloran letter presuppose knowledge of the content of the present application. In other words, the Halloran letter can only be interpreted in view of the present specification and claims. Consequently, the Halloran letter solely proves that a person skilled in the art is able to make use of the invention described in the patent application. Nothing more.

In fact, the Halloran letter is being misconstrued as it was only be provided to show that the skilled artisan is able make use of the claimed invention with the specified enlargement factor **(f)**, wherein other enlargement factors are known (but the claimed enlargement factor **(f)** is not known). Stating what is known in the art is not stating that the present invention is obvious, nor is there any admission by Appellants that the claimed enlargement factor **(f)** could be derived given the disclosure in Wohlwend and the state of the art (based on the ordinary skill in the art, which is why Halloran is being cited).

Halloran is being misconstrued for another reason. While Halloran refer to starting density in the field of ceramics, referring to the level of skill in the art does not mean there is a solution to the problem or that the present invention is being accomplished. *Ex parte Kuhn; In re Baird; supra.* As explained, the Examiner has not taken into account the specific variables in the art or how one of ordinary skill in the art would be guided to the present invention. No scientific model or mathematical relation is provided in the Halloran letter. One of ordinary skill in the art cannot be aware of a problem in the art and then all of a sudden achieve the present invention. Even homogeneity of the blank is not even mentioned as being a factor in determining an enlargement factor. Appellants note that an invention as a whole is not restricted to the specific

subject matter claimed, but also embraces its properties and the problem(s) it solves. *In re Wright*, 6 USPQ2d 1959, 1962 (Fed. Cir. 1988); *In re Sponnoble*, 160 USPQ 237 (CCPA 1969).

Thus, how can something be "routine" (Office Action, page 6, last paragraph) when the art (or the Examiner) does not recognize, e.g., homogeneity of the blank as being a factor? The Halloran letter is being misconstrued as prior art, and this is a factual error as well as a legal error in forming Rejection (1) (as well as in Rejections (2)-(3)).

Further, there is no basis to combine Wohlwend with Halloran (or vice versa). Neither reference recognizes the mentioned preconditions. There is even no disclosure of a cube root, nor a cube root of ρ_S/ρ_R. Further, Appellants have explained why Wohlwend refers to purely empirical enlargement factors, (e.g., the skilled artisan would assume a non-isotropic enlargement factor; empirical enlargement factors represent averaged values and are much less precise), which is "one-size fits all" factor, that would not even lead to the instantly claimed methods.

Also, combining known prior art elements is not sufficient to render the claimed invention obvious if the results would not have been predictable to one of ordinary skill in the art. *United States v. Adams*, 383 U.S. 39, 51-52, 148 USPQ 479, 483-84 (1966). Again, the results cannot be predictable if the instantly claimed enlargement factor **(f)** is not even known, Wohlwend does not disclose any linear relationship between its enlargement factor (which is a one-size fits all) and shrinkage of the blank, and Halloran refers to the enlargement factor "*as defined in the patent application*" and is not prior art. Even if assuming that Halloran is "prior art", there is no disclosure of the instantly claimed enlargement factor **(f).** Appellant again note that any reference to enlargement factors in Halloran has only to do with a purely empirical enlargement factor such as that described in Wohlwend, and is not an admission that the instantly claimed enlargement factor **(f)** is obvious.

Regarding the assertion that the references are being argued "individually" (Office Action, page 14), Appellants respectfully disagree. How else can a patent applicant point out the problems and deficiencies of a reference without discussing the disclosure of that reference? If anything, the references are being considered individually. Appellants were merely relying on

the deficiencies of each reference because the references have been improperly combined (factually and legally) and Appellants are traversing that the references could be properly combined in the first place (e.g., Halloran is not prior art and cannot be properly combined with Wohlwend, which does not even disclose the two preconditions). Thus, Appellants' remarks have not been considered in the context of satisfying all requirements for a *prima facie* case of obviousness and instead improperly dismissed as be directed to arguing the references "individually".

For reasons of record and as stated above, Rejection (1) amounts to a ***clear error*** on the Examiner's part and withdrawal of Rejection (1) is respectfully requested. Legally and factually, there is no *prima facie* case of obvious. Reversal of this rejection of claims 16-34 and 41-43 from the honorable Board is respectfully requested.

Arguments Against **Rejection (1)** of Claim 45

Independent claim 45 is based on pending claim 16. Additionally, two process steps have been included as explained in section **V.** above. The first additional process step is related to the application of data for the enlargement factor on the blank or an attachment label after calculating said enlargement factor. The second additional process step deals with the reading of the data applied on the blank before enlarging the digital description of the positive model. These additional process steps ensure that each blank is labeled with its individually calculated enlargement factor and that the specific enlargement factor of the blank is used for further processing of the blank. Mixing up of individual enlargement factors of different blanks and reading of wrong enlargement factors for further processing can be avoided at the best. It worth noting that the same enlargement factor (f) is recited in independent claim 44. Thus, the arguments above apply to this rejection of claim 45 as well.

Also, in view of the cited references, these additional process steps are novel and non-obvious for other following reasons. For instance, since Wohlwend teaches the use of general and non-individual enlargement factors, there is no need to apply individual information related

to the enlargement factor on each blank. Consequently, Wohlwend does not mention at all that enlargement factors may be applied on the blank.

Reversal of the rejection of claim 45 is respectfully requested.

Arguments Against **Rejection (2)** of Claim 44

Independent claim 44 adds to previously submitted independent claim 16 the additional process step of supplementing an incomplete positive model by computer technology. Also, the same enlargement factor **(f)** is recited in independent claim 44. Thus, the arguments above apply to Rejection (2) of claim 44 as well.

Further, suffice it to say that there is nothing in the references cited by the Examiner which suggests the additional process step of supplementing an incomplete positive model with computer technology.

Also, the further citation of Guiot does not make the combination of Wohlwend and Halloran any more proper as explained above. For instance, Halloran is not even prior art, and there is no admission by Appellants that the instantly claimed enlargement factor **(f)** could be derived given the disclosure in the cited references. Wohlwend even merely discloses a one-size fits all enlargement factor and fails to recognize any preconditions.

Accordingly, it is respectfully submitted that claim 44 is patentable over the cited combination of references the reasons set forth above with regard to independent claim 16 and for the additional reasons that Halloran is improperly cited and the references fail to teach the further process step of supplementing an incomplete positive model by computer technology. Rejection (2) of claim 44 should be reversed.

Arguments Against **Rejection (3)** of Claim 46

Independent claim 46 is based on pending claim 16. Additionally, the removing of an outer layer of the blank has been included. This additional process step will insure that any existing density gradients in the outer material shell of the blank are removed. Consequently, the homogeneity of the blank is raised to a level which allows for application of the claimed formula

for the enlargement factor. It is worth noting that the enlargement factor (f) is recited in independent claim 46. Thus, the arguments above apply to Rejection (3) of claim 46 as well.

In addition, the further citation of Glass does not make the combination of Wohlwend and Halloran any more proper as explained above.

Appellants respectfully request the honorable Board to reverse Rejection (3) of claim 46.

Conclusion

For the foregoing reasons, the Board is hereby requested to reverse the rejection of claims 16-34 and 41-46 and remand the instant application back to the Examiner for allowance.

Therefore, these rejections amount to ***clear errors*** on the Examiner's part and withdrawal of Rejections (1)-(3) is respectfully requested.

Dated: January 19, 2010

Respectfully submitted,

By [signature]

Charles Gorenstein
Registration No.: 29,271
BIRCH, STEWART, KOLASCH & BIRCH, LLP
8110 Gatehouse Road
Suite 100 East
P.O. Box 747
Falls Church, Virginia 22040-0747
(703) 205-8000
(703) 205-8050 (Fax)
mailroom@bskb.com (E-Mail)
Attorney for Applicant

VIII. CLAIMS APPENDIX

16. A process for production of an artificial tooth substitute to be fitted on a prepared dental stump comprising the steps of:

(1) processing ceramic powder to form a homogeneous blank of porous ceramic material;

(2) determining a relative density ρ_R and an achievable relative density ρ_S after sintering for the blank of porous ceramic material selected in step (1);

(3) calculating an enlargement factor (f) for the obtained data in accordance with the following

$$f = \sqrt[3]{\frac{\rho_S}{\rho_R}}$$

where ρ_R is the relative density and ρ_S is the achievable relative density after sintering determined in step (2);

(4) scanning and digitizing a three-dimensional outer and inner surface of a positive model of a skeletal structure for the artificial tooth substitute to obtain data;

(5) enlarging the obtained data linearly in all directions by the enlargement factor (f) calculated in step (3) thereby compensating precisely for sinter shrinkage to obtain modified data for an enlarged model;

(6) transferring the modified data to a control unit of a processing machine;

(7) processing the blank of porous ceramic material selected in step (1) in the processing machine and removing material therefrom to produce a design form of the enlarged model;

(8) sintering the design form of porous ceramic material to obtain a skeletal structure having precise end dimensions;

(9) facing the skeletal structure as desired to form the artificial tooth substitute; and

(10) repeating steps (1) through (9) for each artificial tooth substitute to be produced.

17. A process according to claim 16, wherein the artificial tooth substitute is formed with fine run-out margins.

18. A process according to claim 16, wherein the sintering of the enlarged model comprises sintering to a density within the range of 90 to 100% of the achievable relative density.

19. A process according to claim 16, wherein the sintering of the enlarged model comprises sintering to a density within the range of 96 to 100% of the achievable relative density.

20. A process according to claim 16, wherein the sintering of the enlarged model comprises sintering to a density within the range of greater than 99% of the achievable relative density.

21. A process according to claim 16, wherein the blank is a presintered blank of pressed fine ceramic powder.

22. A process according to claim 16, wherein the processing includes processing the blank in a first rough machining and then a second final machining.

23. A process according to claim 16, wherein, prior to the processing, the blank is heat treated at temperatures in the range from 50 to 200°C for a duration of 2 to 20 hours.

24. A process according to claim 16, wherein, prior to the processing, the blank is heat treated at temperatures in the range from 90 to 150°C for a duration of 2 to 6 hours.

25. A process according to claim 23, wherein the processing of the blank into the enlarged model follows the heat treatment.

26. A process according to claim 24, wherein the processing of the blank into the enlarged model follows the heat treatment.

27. A process according to claim 21, including a step of presintering the blank for 0.5 to 6 hours at a temperature of at least 450°C.

28. A process according to claim 16, wherein the ceramic material is selected from the group consisting of Al_2O_3, TiO_2, MgO, Y_2O_3, zircon oxide mixed crystal

$$Zr_{1-x}Me_x\, O_{2-(\frac{4n}{2})x},$$

and mixture thereof, where Me is a metal which is present in the oxide form as a bi-, tri-, or tetravalant cation ($n = 2, 3, 4$ and $0 \leq x \leq 1$) and stabilises the tetragonal and/or cubic phase of the zircon oxide.

29. A process according to claim 28, wherein the ceramic material is mixed with an organic binding agent selected from the group consisting of polyvinyl alcohols (PVA), polyacrylic acids (PAA) , celluloses, polyethyleneglucols, and mixtures thereof.

30. A process according to claim 29, wherein the proportion of binding agent lies in the range from 0.1 to 45 vol%.

31. A process according to claim 29, wherein the proportion of binding agent lies in the range from 0.1 to 5 vol%.

32. A process for production of an artificial tooth substitute to be fitted on a prepared dental stump comprising the steps of:

(1) scanning and digitizing a three-dimensional outer and inner surface of a positive model of a skeletal structure for the artificial tooth substitute to obtain data;

determining an enlargement factor (f) for the obtained data in accordance with the following

$$f = \sqrt[3]{\frac{\rho_S}{\rho_R}}$$

where ρ_R is the relative density and ρ_S is the achievable relative density after sintering;

(3) enlarging the obtained data linearly in all directions by the enlargement factor (f) thereby compensating precisely for sinter shrinkage to obtain modified data for an enlarged model;

(4) transferring the modified data to a control unit of a processing machine for generating a desired path of a tool;

(5) ceasing scanning and digitizing;

(6) processing a blank of porous ceramic material in the processing machine wherein material is removed by the tool moving along the devised path to produce a design form of the enlarged model;

(7) dense-sintering the design form of porous ceramic material to obtain a skeletal structure having precise end dimensions;

(8) facing the skeletal structure as desired to form the artificial tooth substitute; and

(9) repeating steps (1) through (8) for each artificial tooth substitute to be produced.

33. A process for production of an artificial tooth substitute to be fitted on a prepared dental stump comprising the steps of:

(1) processing ceramic powder to form a homogeneous blank of porous ceramic material having a relative density p_R;

(2) sintering a further piece of the porous ceramic material under a set of sintering conditions to obtain an achievable relative density ps of the ceramic material after sintering;

(3) determining an enlargement factor (f) for the obtained data in accordance with the following

$$f = \sqrt[3]{\frac{\rho_S}{\rho_R}}$$

where ρ_S is the relative density of the preprepared blank and ρ_S is the achievable relative density of the porous ceramic material after sintering obtained in step (2);

(10) scanning and digitizing a three-dimensional outer and inner surface of a positive model of a skeletal structure for the artificial tooth substitute to obtain data;

(11) enlarging the obtained data linearly in all directions by the enlargement factor (f) thereby compensating precisely for sinter shrinkage to obtain modified data for an enlarged model;

(12) transferring the modified data to a control unit of a processing machine;

(13) processing the blank of porous ceramic material in the processing machine and removing material therefrom to produce a design form of the enlarged model;

(14) sintering under the set of sintering conditions of step (b) the design form of porous ceramic material to obtain a skeletal structure having precise end dimensions;

(15) facing the skeletal structure as desired to form the artificial tooth substitute; and

(16) repeating steps (1) through (9) for each artificial tooth substitute to be produced.

34. A process according to claim 28, wherein the ceramic material is mixed with an organic binding agent comprising thermoplastics.

41. A process according to claim 16, wherein the enlargement factor is calculated to .000x, where x is an integer.

42. A process according to claim 32, wherein the enlargement factor is calculated to .000x, where x is an integer.

43. A process according to claim 33, wherein the enlargement factor is calculated to .000x, where x is an integer.

44. A process for production of an artificial tooth substitute to be fitted on a prepared dental stump comprising the steps of:

(1) processing ceramic powder to form a homogeneous blank of porous ceramic material;

(2) determining a relative density ρ_R and an achievable relative density ρ_S after sintering for the blank of porous ceramic material selected in step (1);

(3) calculating an enlargement factor (f) for the obtained data in accordance with the following

$$f = \sqrt[3]{\frac{\rho_S}{\rho_R}}$$

where ρ_R is the relative density and ρ_S is the achievable relative density after sintering determined in step (2);

(4) scanning and digitizing a three-dimensional outer and inner surface of a positive model of a skeletal structure for the artificial tooth substitute to obtain data, whereby a positive model reflecting incompletely a situation in a patient's mouth is supplemented with regard to the three-dimensional outer and inner surfaces by computer technology;

(5) enlarging the obtained data linearly in all directions by the enlargement factor (f) calculated in step (3) thereby compensating precisely for sinter shrinkage to obtain modified data for an enlarged model;

(6) transferring the modified data to a control unit of a processing machine;

(7) processing the blank of porous ceramic material selected in step (1) in the processing machine and removing material therefrom to produce a design form of the enlarged model;

(8) sintering the design form of porous ceramic material to obtain a skeletal structure having precise end dimensions;

(9) facing the skeletal structure as desired to form the artificial tooth substitute; and

(10) repeating steps (1) through (9) for each artificial tooth substitute to be produced.

45. A process for production of an artificial tooth substitute to be fitted on a prepared dental stump comprising the steps of:

(1) processing ceramic powder to form a homogeneous blank of porous ceramic material;

(2) determining a relative density ρ_R and an achievable relative density ρ_S after sintering for the blank of porous ceramic material selected in step (1);

(3) calculating an enlargement factor (f) for the obtained data in accordance with the following

$$f = \sqrt[3]{\frac{\rho_S}{\rho_R}}$$

where ρ_R is the relative density and ρ_S is the achievable relative density after sintering determined in step (2), and applying data for the enlargement factor (f) to be detectable optically, electromagnetically or mechanically-tactile on the blank, an attachment label or a packing leaflet;

(4) scanning and digitizing a three-dimensional outer and inner surface of a positive model of a skeletal structure for the artificial tooth substitute to obtain data;

(5) by use of an identification system, reading the data for the enlargement factor (f) applied on the blank, the attachment label or the packing leaflet, and enlarging the data obtained in step (4) linearly in all directions by the enlargement factor (f) calculated in step (3) thereby compensating precisely for sinter shrinkage to obtain modified data for an enlarged model;

(6) transferring the modified data to a control unit of a processing machine;

(7) processing the blank of porous ceramic material selected in step (1) in the processing machine and removing material therefrom to produce a design form of the enlarged model;

(8) sintering the design form of porous ceramic material to obtain a skeletal structure having precise end dimensions;

(9) facing the skeletal structure as desired to form the artificial tooth substitute; and

(10) repeating steps (1) through (9) for each artificial tooth substitute to be produced.

46. A process for production of an artificial tooth substitute to be fitted on a prepared dental stump comprising the steps of:

(1) processing ceramic powder to form a homogeneous blank of porous ceramic material and removing an outer layer of the blank of porous ceramic material selected in step (1) in order to remove any existing density gradients in an outer material shell;

(2) determining a relative density ρ_R and an achievable relative density ρ_S after sintering for the blank of porous ceramic material selected in step (1);

(3) calculating an enlargement factor (f) for the obtained data in accordance with the following

$$f = \sqrt[3]{\frac{\rho_S}{\rho_R}}$$

where ρ_R is the relative density and ρ_S is the achievable relative density after sintering determined in step (2);

(4) scanning and digitizing a three-dimensional outer and inner surface of a positive model of a skeletal structure for the artificial tooth substitute to obtain data;

(5) enlarging the data obtained in step (4) linearly in all directions by the enlargement factor (f) calculated in step (3) thereby compensating precisely for sinter shrinkage to obtain modified data for an enlarged model;

(6) transferring the modified data to a control unit of a processing machine;

(7) processing the blank of porous ceramic material selected in step (1) in the processing machine and removing material therefrom to produce a design form of the enlarged model;

(8) sintering the design form of porous ceramic material to obtain a skeletal structure having precise end dimensions;

(9) facing the skeletal structure as desired to form the artificial tooth substitute; and

(10) repeating steps (1) through (9) for each artificial tooth substitute to be produced.

IX. EVIDENCE APPENDIX

None.

X. RELATED PROCEEDINGS APPENDIX

None. No related proceedings are referenced, hence copies of decisions in related proceedings are not provided.